FORMULA MILK PREPARATION APPARATUS AND METHOD

This invention relates to formula milk preparation apparatus, a method of using such apparatus, and formula milk prepared using the apparatus and/or method.

The term 'formula milk' is throughout intended to mean any type of powdered milk which is mixed with liquid to enable consumption. This type of milk is commonly used with babies, toddlers and infants.

It is well known that it is not good practice to pre-prepare a formula milk drink too far in advance of the intended consumption time. However, especially with young children, such as babies, it is often difficult to prepare the formula milk drink only at the time when the child is hungry, since the child is often displaying a reasonable amount of distress. This makes it very awkward for the person needing to prepare the formula milk drink, since they may well have to concentrate on the intended recipient rather than making the drink.

Furthermore, the powdered formula milk must be mixed with reasonably hot water. The drink therefore requires time to cool to a suitable temperature before drinking. Faster cooling can be achieved if the mixture can be moved and/or subjected to a colder environment, such as cold running water. However, this typically requires intervention from the person preparing the drink, which can, again, often be difficult if the intended recipient of the drink is showing distress.

The present invention seeks to overcome these problems.

According to a first aspect of the present invention, there is provided Formula milk preparation apparatus comprising:

a support structure,

first and second containers supported by the support structure, the first container being adapted to hold a liquid, and the second container being adapted to hold powdered formula milk,

means for regulating the temperature of the contents of the first container;

means for dispensing an amount of content of the first and second containers; and

means for mixing together the contents dispensed from the first and second containers.

Preferable and/or optional features of the first aspect of the invention are set forth in claims 2 to 15, inclusive.

According to a second aspect of the present invention, there is provided a method of preparing formula milk using preparation apparatus as claimed in any one of the preceding claims, comprising the steps of :

a. inserting liquid into the first container;

b. inserting powered formula milk into the second container;

c. the regulating means bringing and maintaining the temperature of the

liquid in the first container at a predetermined temperature;

d. dispensing an amount of the liquid in the first container and the powdered milk in the second container into a or the third container; and

e. the mixing means mixing the liquid and powdered milk together.

Preferable and/or optional features of the second aspect of the invention are set forth in claims 17 to 21, inclusive.

According to a third aspect of the present invention, there is provided formula milk prepared using apparatus and/or a method as claimed in any one of the preceding claims.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which :

Figure 1 is a front view of one embodiment of formula milk preparation apparatus, in accordance with the first aspect of the present invention;

Figure 2 is a side view of the formula milk preparation apparatus shown in Figure 1;

Figure 3 is a partial cross-sectional front view of the formula milk preparation apparatus;

Figure 4 is a top plan view of the formula milk preparation apparatus;

Figure 5 is an enlarged plan view of jaws of the formula milk preparation apparatus;

Figure 6 is an enlarged front view of the jaws;

Figure 7 is an enlarged front view of part of a crank mechanism of the formula milk preparation apparatus;

Figure 8 is an enlarged side view of the part of the crank mechanism shown in Figure 7;

Figure 9 is a schematic section along the line A-A in Figure 3 through one container of the apparatus;

Figure 10 is a schematic section along the line B-B in Figure 3 through part of dispensing means of the apparatus; and

Figure 11 is a schematic section along the line C-C in Figure 3 through another part of the dispensing means of the apparatus.

Referring now to the drawings, there is shown formula milk preparation apparatus 10 which comprises a support structure 12, and first and second containers

14 and 16. The support structure 12 is generally in the form of a stand, having a base portion 18 and an upright back portion 20 fixed to the base portion 18. The first and second containers 14 and 16 are held to the back portion 20 and overhang the base portion 18. The first and second containers 14 and 16 have closable openings 22 in their top surfaces, and may be separable from the support structure 12, for example to aid refilling. In this case, each container 14 and 16 may include a handle or grip (not shown).

The first container 14 is adapted to hold a liquid, and the second container 16 is adapted to hold powdered formula milk. Although both containers 14 and 16 are shown as having generally square transverse cross-sections, the containers may have any suitable shape cross-section, such as circular.

The preparation apparatus 10 includes means for regulating the temperature of the contents of the first container 14. This may take any suitable form, and in this case is in the form of an electrically energisable heating jacket or sleeve 24 positioned along or around the inner wall of the first container 14. The heating sleeve 24 is controlled by a micro-control unit (not shown) to regulate the temperature of the contents of the first container 14 to a user pre-set value, which includes a value or values between 90°C and 100°C, and a value or values between 60°C and 70°C.

The preparation apparatus 10 also includes means for dispensing an amount of content from both the first and second containers 14 and 16. An electric-motor-operated pump 26, in fluid-communication with an opening 28 in the base 30 of the

first container 14, is utilised to dispense liquid from the first container 14. The motor-operated pump 26 is controlled via the micro-control unit mentioned above.

A motor-operated turntable arrangement 32 is used to enable a predetermined amount of powdered formula milk to be dispensed from the second container 16. As shown in Figures 9 to 11, and with reference to Figure 3, a turntable 34 of the turntable arrangement 32 is partitioned into four segments 36 to form a '+' shape open at the top and bottom. The turntable 34 is rotatably driveable by an electric motor 38 mounted in the base 40 of the second container 16. The electric motor 38 is controlled by the micro-control unit mentioned above.

A separate roof portion 42 extends over the turntable 34. The roof portion 42 has a cut-out 44 corresponding in dimensions to one segment 36 of the partitioned turntable 34. The roof portion 42 is generally in the form of an inverted cone and extends across the second container 16 in a plane generally parallel to, and spaced from, a plane of the top opening 22 of the second container 16. A separate base 46 of the turntable arrangement 32 corresponds to the base 40 of the second container 16, and includes a sloping portion 48 corresponding in dimensions to one segment 36 of the partitioned turntable 34. The sloping portion 48 slopes downwards from the turntable 34 towards an opening 50 in the base 40 of the second container 16. The position of the sloping portion 48 of the base 46 of the turntable arrangement 32 relative to the cut-out 44 of the roof portion 42 may vary, but is never in direct vertical alignment. In the present embodiment, the sloping portion 48 of the base 46 is diametrically opposite the cut-out 44 of the roof portion 42.

The base 46 of the turntable arrangement 32, excluding the sloping portion 48, is parallel or substantially parallel to the turntable 34 and supports the turntable 34 during rotation.

Any other suitable means could be utilised to enable an amount of the contents of the first and second containers 14 and 16 to be dispensed.

The preparation apparatus 10 is also provided with means for mixing the contents dispensed from the first and second containers 14 and 16. In this embodiment, it is intended that a third container (not shown), typically in the form of a baby feeding bottle, will be provided and the first and second containers 14 and 16 will dispense into the third container. To this end, jaws 54 are supported for reciprocating up-and-down movement by the support structure 12. The jaws 54 are spring-loaded, as can be seen in Figures 5 and 6, to enable the third container (baby feeding bottle, not shown) to be securely but removably held on the support structure 12. Each jaw 54 may include teeth or ridges (not shown) to enhance gripping the third container. Alternatively, the teeth or ridges, if provided, may be formed as part of a plastics or rubber sleeve (not shown) into which each jaw 54 can be inserted.

The mixing means includes a motor-operated crank mechanism 56, which, although depicted as being external, is preferably hidden from view within the back portion 20 of the support structure 12. The crank mechanism 56 is supported by the support structure 12 and comprises a crank arm 58, driven by an electric-motor (not shown), and a piston arm 60 pivotably connected to the crank arm 58 at one end and

the jaws 54 at the other end. The jaws 54 slide in a vertically extending first run 62. Thus, on operating the crank mechanism 56, the jaws 54 are moved upwards and downwards along the vertical first run 62. The micro-control unit, mentioned above, controls the operation of the electric motor of the crank mechanism 56.

The crank mechanism 56 could be replaced by any other suitable means for mixing the contents dispensed from first and second containers 14 and 16. For example, vibration, rotation and/or stirring can be utilised.

Means for cooling the mixture produced by the mixing means is also provided as part of the preparation apparatus 10. In this embodiment, the cooling means is formed as part of the mixing means, and takes the form of dispersing the contents of the first and second containers 14 and 16 over the surface of the third container while they are being mixed. This has the effect of introducing the mixture to a larger surface area which is at a lower temperature due to its exposure to ambient temperature, thus resulting in increased cooling. Further steps, such as pre-cooling the third container prior to use could also be considered. For example, the feeding bottle could be kept in a refrigerator,

The third container (not shown), in this case the feeding bottle, is formed with a hinged cap attached to the third container. The hinged cap, when closed over the opening to the third container, fluid-tightly seals around the opening. The hinged cap typically includes a rubber teat mounted thereon, and may also include a removable cover which covers the rubber teat and prevents contamination prior to use.

The hinged cap and third container include a snap-fit fastening formation formed opposite the hinge. When flipped over, the hinged cap fastens to the third container and fluid-tightly seals around the opening.

To automate the closure of the third container, the preparation apparatus 10 includes a closure mechanism 64 supported on the back portion 20 of the support structure 12. The closure mechanism 64 comprises a paddle 66 slidable in a vertical second run 68. The paddle 66 is driven by an electric motor (not shown) which is controlled by the micro-control unit. The vertical second run 68 is parallel to the vertical first run 62 along which the jaws 54 move. The paddle 66 is of suitable dimensions to enable forcible contact with the hinged cap of the third container when held by the jaws 54. This contact is sufficient to cause full engagement of the snap-fit fastening formation on the hinged cap and third container.

A user input device 70 is provided on one side of the preparation apparatus 10. The micro-control unit is preprogrammed to accept a number of predetermined user inputs via the user input device 70. For example, the micro-control unit can be instructed to boil a liquid held in the first container 14, and/or regulate the temperature of a liquid held in the first container 14 to one or more user-selected temperatures. The micro-control unit can also be instructed to dispense differing amounts of content from the first and second containers 14 and 16, depending on the quantity of formula milk desired and/or the relative amounts of the contents. The micro-control unit includes a variety of pre-set programmes which automate the entire task of preparing the formula milk, from the dispensing of the contents based on the

volume of formula milk required, to the duration of mixing and cooling. The micro-control unit may also include a timer to enable automation to begin at a certain time, set through the user input device 70, and a manual over-ride facility to allow pausing and/or cancellation partway through a programme. The user input device 70 also includes a standard 'start' input which allows immediate usage of the apparatus.

A sensor (not shown) is placed on the jaws 54 to determine the presence of the third container. Operation of the preparation apparatus 10 is prevented by the micro-control unit if it is sensed that the third container is not present.

In use, a liquid, typically water, is poured into the first container 14, and powdered formula milk is placed in the second container 16. The desired temperature of the liquid is set through the user input device 70, and the temperature of the liquid is regulated by the regulation means to maintain this temperature.

The third container, which is initially empty, is inserted between the jaws 54. Based on the user input, the dispensing means operates to dispense a predetermined amount of content from the first and second containers 14 and 16 into the third container. The motor-operated pump 26 discharges liquid from the second container, through the opening 28 in the first container 14; and powdered formula milk fills one segment 36 of the turntable 34 which, through the rotation of the turntable 34, aligns with and discharges through the opening 50 in the second container 16. The third container is then closed via the closure mechanism 64, and the mixing means and the cooling means operate to mix and cool the contents of the third container. Once the

contents of the third container are brought to a temperature suitable for consumption, the mixing and cooling means halt to allow demounting of the third container.

The micro-control unit enables the operation of the dispensing means, the mixing means and the cooling means to be delayed for a predetermined, or an indeterminate, period. Therefore, the liquid and powdered milk can be loaded into the first and second containers 14 and 16, and the temperature of the liquid can be regulated until such time that the formula milk is required. At this time, the 'start' input is simply pressed and the remainder of the process is automatically performed.

The micro-control unit may have a memory function to forego the necessity of repeatedly selecting a programme, amount to be dispensed, and/or period of operation of the cooling means. This allows simple 'one touch' operation via the 'start' input on the user input device 70.

The apparatus may be provided with a sensor (not shown) for determining the temperature of the contents of the third container. Additionally, or alternatively, operation of the cooling means may be based on predetermined values derived from the temperature of the liquid in the first container 14 and the amount of content or contents dispensed.

In a second embodiment of the invention, the formula milk preparation apparatus is substantially as described above, except that the third container is used solely to mix the contents dispensed from the first and second containers, and to cool

the mixture. The formula milk can then be dispensed from the third container into a fourth container, which in this case would be the feeding bottle.

The third container is demountably held by the support structure, to enable simplified cleaning, and may be mounted internally within the support structure. The dispensing means, mixing means, and cooling means are as described in the first embodiment. However, the closure mechanism of the first embodiment can be dispensed with, since the feeding bottle is no longer being shaken by the apparatus, and the jaws may take another form more suitable for holding the third container in place during mixing.

In a modification to the embodiments, the cooling means could be prior to the third container, i.e. the liquid is cooled before it enters the third container, or the cooling means could be subsequent to the third container, i.e. the mixture as a whole is cooled after it leaves the third container and before it enters the feeding bottle.

In the embodiments described above, the cooling means could alternatively, or additionally, be in the form of a cold water jacket, or other type of heat sink, either surrounding the third container and/or through which the liquid and/or mixture flows.

The base of the support structure may be provided with a drip tray (not shown).

The preparation apparatus is generally water-proof or water resistant to protect

against the damaging effects of liquid splashes. All electrical items are, typically, fluid-tightly sealed to reduce electrical hazards.

The preparation apparatus as a whole is formed generally from plastics or metal.

The term 'container' used throughout the specification is intended to encompass any type of defined space, and as such the first and second containers, or even the first, second, and third containers, could be in the form of a single unit simply partitioned to provide suitable volumes.

It is thus possible to provide formula milk preparation apparatus which automates the task of preparing milk from powdered formula milk. It is also possible to provide apparatus which produces formula milk at a suitable temperature for immediate consumption. The apparatus also enables automatic preparation of formula milk at a predetermined time.

The embodiments described above are given by way of example only, and modifications will be apparent to persons skilled in the art without departing from the scope of the invention as defined by the appended claims. For example, the regulating means could be in the form of an electrically energisable hot plate, instead of the heating jacket or sleeve; and a manually operable pump or a turntable arrangement as previously described could be used in place of the motor-operated pump in the first container to dispense liquid.